Studies on African zygaenoid moths (Lepidoptera: Zygaenoidea): *Parapsycharium* n.gen. (Somabrachyidae) from the Western Cape Province, South Africa

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A new genus, *Parapsycharium* n.gen. and its type species, *P. paarlense,* are described in Somabrachyidae. A key to the somabrachyid genera *Somabrachys* Kirby, *Psycharium* Herrich-Schäffer and *Parapsycharium* n.gen. is given. The description of the new taxon includes the description of its final instar larva.

Key words: taxonomy, generic key, wing venation, genital structure, larva.

INTRODUCTION

The African flannel moths (Somabrachyidae) form a group of medium-sized moths belonging to two, perhaps three, geographically separated genera. *Somabrachys* Kirby is essentially Palaearctic and occurs in a broad coastal belt bordering the southern and eastern part of the Mediterranean Sea (Laithwaite *et al.* 1975) and was more recently found in southern Spain (de Freina & Witt 1990). *Psycharium* Herrich-Schäffer is found in South Africa from the southwestern Cape east- and northward along a broad coastal belt into KwaZulu-Natal (Geertsema 1998). *Boisduvalodes tamatavana* (Oberthür), described by Oberthür (1922), is known from eastern Madagascar. This taxon may also belong to the Somabrachyidae (Tremewan 1973; H.G., pers. obs.), but is at present placed in Limacodidae (Viette 1980).

Members of Somabrachyidae from southern Africa were poorly known until recently. Studies during the past decade, mainly in the Western Cape Province, South Africa, have added considerably to our knowledge of these moths. The placement and relationships of the family (Epstein *et al.* 1999), the description of the type species of *Psycharium, P. pellucens,* and four new species of *Psycharium* (Geertsema 1998) and descriptions of some mature larvae (Geertsema 2000) are recent contributions.

In 1971, somabrachyid moths, all males, were collected by light-trapping at the Zachariashoek Forest Reserve, near Paarl, Western Cape Province, South Africa. During field work in October 1979 on the lower west slope of Paarl Mountain, Paarl, some larvae showing resemblance to those of *Psycharium,* feeding on the exotic *Pinus radiata* D. Don. (Coniferae) and the indigenous *Restio filiformis* Poir (Restionaceae), were collected. The larvae were reared to the adult stage, producing winged males and apterous females. A comparison of the material from Zachariashoek and Paarl Mountain with the described species of *Psycharium* and *Somabrachys codeti* (Austaut), including wing venation and other taxonomic details, showed them to be different. Although males of *Somabrachys* and of the Zachariashoek and Paarl material are similar in appearance, *Somabrachys* differs in having protibial spines and strongly developed frontal protuberances (Jordan 1916). Only the male of *Somabrachys* is winged, the females being apterous. Both sexes of *Psycharium* are winged. In *Psycharium* the upper angle of the forewing cell is acute, R_1 is a short vein connecting with Sc slightly beyond apex of cell, the upper arm of M is closer to the origin of M_2 than M_1, the apex of forewing is broadly acute, and the anal angle is obtuse. In *Parapsycharium* the upper angle of the forewing cell is almost right-angled, R_1 is long, initially parallel to Sc, then with Rs_1, the upper arm of M is closer to M_1 than M_2, the apex of forewing is rounded, outer margin almost straight and the anal angle is almost right-angled. *Parapsycharium* and *Somabrachys* share the following synapomorphies: apterous females, a triangularly shaped forewing, in *Parapsycharium* mature larva without group of spoon- or ladle-like setae anterior to abdominal verrucae SD, a character possibly shared with *Somabrachys.* Tentative autapomorphies for *Somabrachys* are the male frenulum consisting of six twisted setae, forehead with prominence and foreleg clawed. Male genital characters provide few, if any, useful generic characters, a feature also common to the sister-group Limacodidae (Janse 1964; Viette 1980). Female genitalia of *Psycharium* and *Parapsycharium* (that of *Somabrachys* being unknown at present) show little differences except that in *Parapsycharium* the lateral arm is broader and anteriorly produced. Janse (1964) also found that in the Limacodidae at the generic level, female genitalia were less informative than those of males. It was decided, therefore, to erect a new genus, *Parapsycharium* n.gen., to accommodate the material from Paarl and Zachariashoek. Larvae of Somabrachyidae possess distinctive specific characters (Oberthür 1911; Powell 1916; Geertsema 2000). The larvae of the new taxon differ clearly from those of *Psycharium,* and a larval description, using the system of Geertsema (2000), is also provided here. The most obvious differences between the mature larvae is that those of *Parapsycharium* have lost the spoon- or ladle-like setae anterior to abdominal verrucae SD, that the integument surrounding the dorsal and subdorsal verrucae is crinkled and that the armature, consisting of stinging verrucae and setae, is less obvious than in *Psycharium* larvae.

Key to the genera of Somabrachyidae

1. Females 2
— Males................................. 4
2. Females winged . . *Psycharium* Herrich-Schäffer
— Females apterous 3
3. Foretibia with spine, frons with process (Palaearctic) .... *Somabrachys* Kirby
— Foretibia without spine, frontal process absent (Afrotropical) .... *Parapsycharium* n.gen. or *Psycharium* (in part)
4. Rs_1 of forewing and $Sc+R_1$ of hind wing terminating near or just beyond wing apex (Palaearctic) .... *Somabrachys* Kirby
— Rs_1 or Rs_{1+2} of forewing and $Sc+R_1$ of hind wing terminating before apex (Afrotropical) 5
5. In forewing R_1 parallel to Sc and Rs_1, upper arm of M closer to M_1 than M_2, apex rounded, anal angle almost right-angled. M_3 and M_2 of hind wing both from lower angle of cell, M continuous with M_1 in hind wing (Fig. 6) .... *Parapsycharium* n.gen.
— In forewing R_1 short, merging with Sc, upper arm of M closer to M_2 than M_1, apex broadly acute, anal angle obtuse. M_3 and M_2 of hind wing from lower angle of cell but not from same origin, M terminating on discocellular posterior to M_1 .... *Psycharium* Herrich-Schäffer

***Parapsycharium* n.gen.**, Figs 1–21

Type-species: *Parapsycharium paarlense* n.sp., original designation.

Etymology. A genus related to *Psycharium*; gender neuter.

Description

Male (Figs 1–2, 6–13). See also species description of *P. paarlense.* Forewing triangular, costa a little incurved, inner margin lobed, retinaculum present, cell over half of wing length, closed, M in cell bifurcate, fork at four-fifths of M, upper prong less developed. R_1 as far from upper angle or stalk of Rs_1 and Rs_{2+3} as Rs_4, Rs_1 before apex, Rs_{2+3} stalked for about one-fourth of Rs_1, Rs_4 free, M_1 slightly nearer to Rs_4 than M_2, discocellular angled inward towards upper arm of veinlet, then obliquely outwards towards M_2, CuA_1 from before lower angle and nearer to M_3 than CuA_2 ; CuA_2 from four-fifths of lower median, trace of CuP, 1A slightly developed, 2A distinct, 3A one-fourth as long as, and forking with, A2. Hind wing pear-shaped, broadly rounded at apex, termen, costa and tornus slightly rounded, inner margin lobed, cell slightly more than half of wing length, closed, with veinlet well developed distally, frenulum present, consisting of six bristles; $Sc+R_1$ and Rs from upper angle, upper discocellular slightly curved inward, lower discocellular obliquely outwards, M_1 between Rs and M_2, continuous with veinlet in cell, M_1 and Rs widely separated, M_2 and M_3 shortly but distinctly stalked, from lower angle, CuA_2 from two-thirds of lower median, CuA_1 from three-fourths of CuA_2 and lower angle, CuP present but weak; two anal veins present but 1A rather weak.

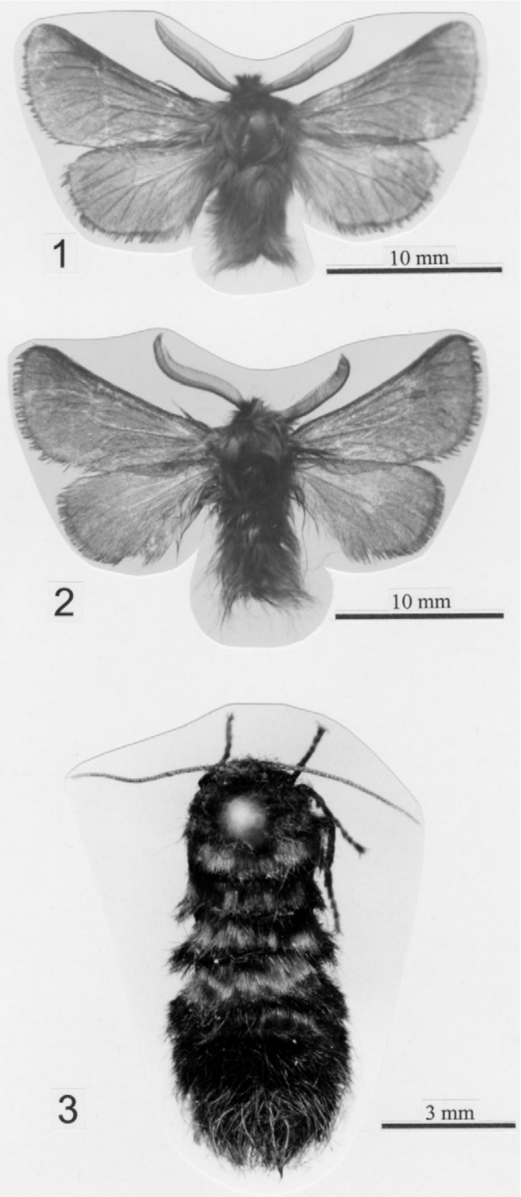
Female. Wingless (Figs 3–4, 14 a,b). See species description of *P. paarlense.*

Facies not unlike *Somabrachys* except that the frenulum consists of six twisted setae in the male and that the enlarged spur on the fore tibiae and frontal process of both sexes is absent in *Parapsycharium.*

Parapsycharium paarlense **n.sp.**, Figs 1–13, 15–21.

Material examined. Holotype, male; South Africa: Western Cape Province: 4 km W of Paarl, Driefontein (33.45S 18.57E), 12.iv.1980, H. Geertsema (TM). Paratypes: same locality as holotype, 2♂, 15.iii.1980, 2.iv.1980 (wing venation: slide preparation Som 034; genitalia preparation Som 019); 2♀, 15.iii.1980, 24.iv.1980; 3♂, 10 km S of Paarl, Zachariashoek Forest Reserve (33.50S 19.04E), 20.iv.1971 (genitalia preparation Som 018), 24.iv.1971 (2), H. Geertsema. Paarl material ex larvis, Zachariashoek material caught at light (MV). Material to be distributed to the Transvaal Museum, Pretoria (TM), National Collection of Insects, Pretoria (NCI), South African Museum, Cape Town (SAM), and Natural History Museum, London (BMNH). Other material: 2♀, same locality as holotype, 15.iii.1980 and 14.iv.1980 (specimen Som 040); 1♂, Zachariashoek Forest Reserve, 24.iv.1971. Slide preparations Som 018, Som 019 and Som 034 to be deposited in the Transvaal Museum.

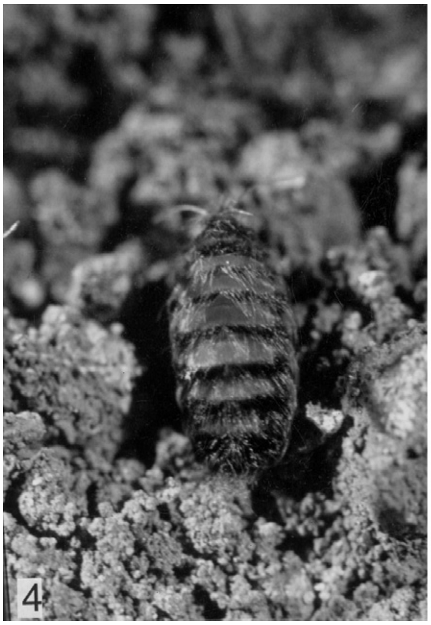
Diagnosis. Overall ground colour of male brownish, distal area of forewing of Zachariashoek specimens with white spot centred on M, extending distally; spot absent in specimens from Paarl. Few suffused spots consisting of some whitish setae in subterminal area and near inner wing margin also present. Chaetosemata well developed. Base of antennae with ochreous-yellow scales, frontal region with upturned, curved, mixed black and white piliform setae. Eye collar on dorsoposterior side forming tuft over eye, anteriorly with broad, short scales. Vestiture of thorax and abdomen mainly brownish to brownish-grey. Wings triangular, legs with brown vestiture. Female apterous, antennae with whitish setae; prothoracic collar distinct and setae on dorsal thorax and abdomen short, consisting of shiny brown setae on anterior and middle sections of segments with longer setae, as long or slightly longer than width of segments, from posterior margins of segments.

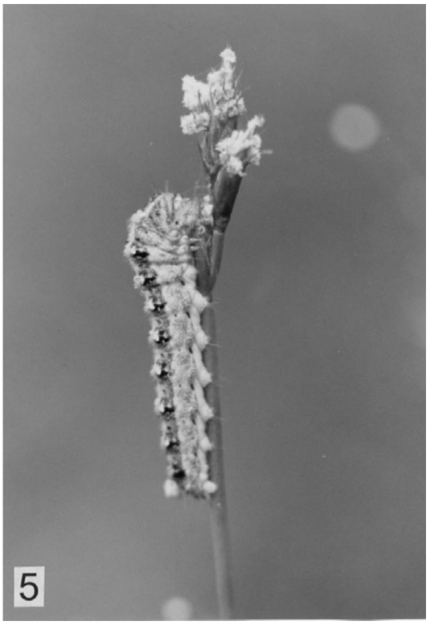


Figs 1–3. Adult moths, *Parapsycharium paarlense* n.gen., n.sp. **1**, Male holotype, Paarl; **2**, male paratype, Zachariashoek; **3**, female paratype, Paarl.

Description

Male (Figs 1–2, 6–13). Wingspan of holotype 28 mm, paratypes 27–30 mm. Antennae pale brown, dorsal shaft sparsely clothed with short setae. Chaetosemata small round areas with short white setae on lateral margin of bare epicranial plate. Posterior to and between antennal bases dark to ochrous-yellow piliform setae, frontal and labral regions with dark brown, bushy setae merging laterally with ridge of bristly brownish curved setae around eye margin; part of ridge absent between antennal base and dorsal part of eye. Rest of vestiture on thorax and abdomen brownish to



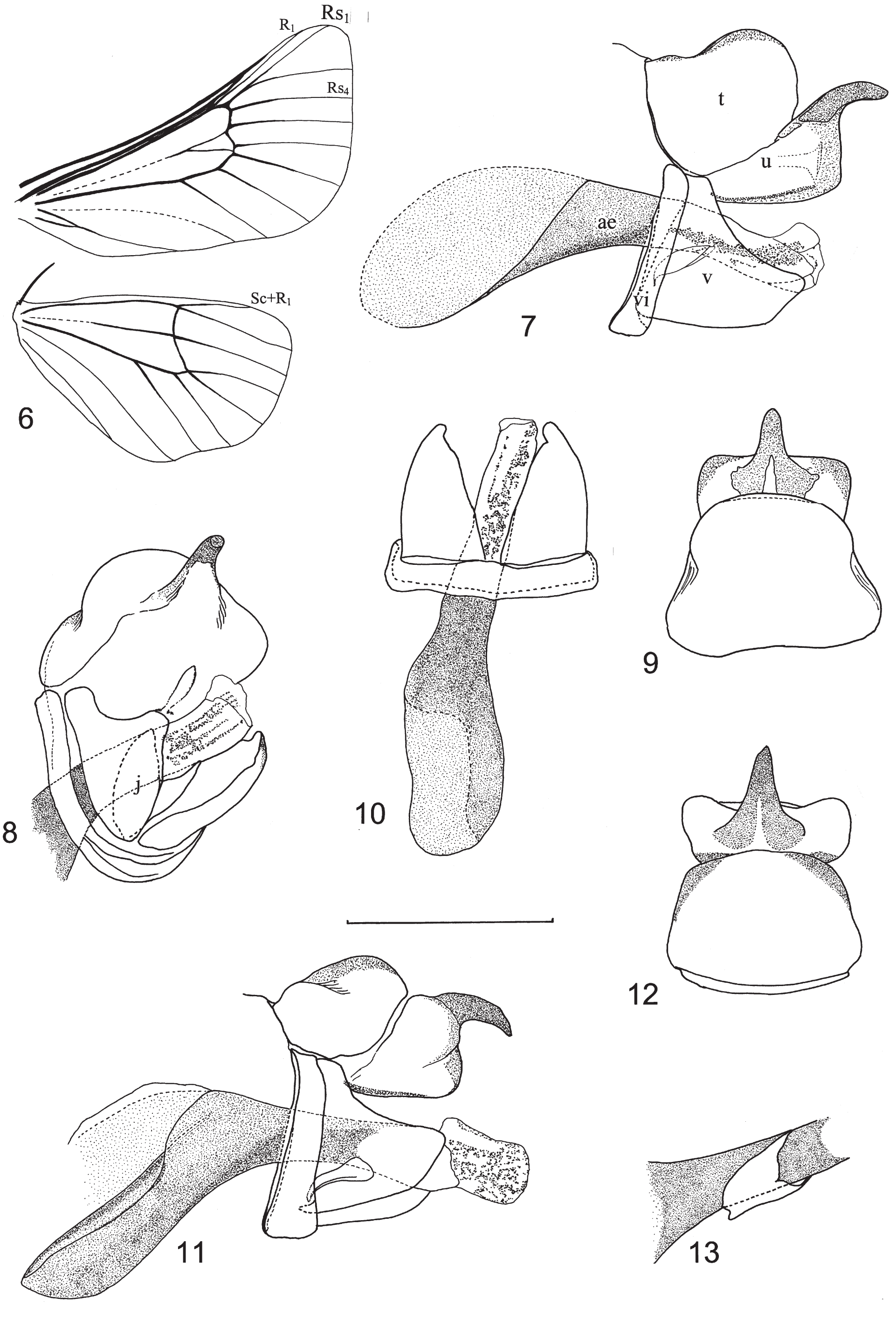


Figs 4–5. *Parapsycharium paarlense* n.gen., n.sp. **4**, Female, newly emerged; **5**, mature larva.

brownish-grey. Legs brownish. Wings similar in colour as abdomen, with marginal wing scales. Wings densely clothed with piliform setae, uniform brown in colour; setae longer near wingbase. On hind wing scales less dense. In one paratype from Zachariashoek a spot is present in the distal area of the cell, centred on M and extending distally to discocellulars, smaller spot posterior to middle of cell, midway between cell and wing margin. Slightly suffused spots consisting of whitish setae in subterminal area and near inner margin of wing; wing margin less rounded, otherwise Zachariashoek material as for Paarl.

Male genitalia (Figs 7–13). Zachariashoek (slide preparation Som 018) (Figs 7–10): tegumen large, posterior two-thirds bulbous, lightly sclerotized except on dorsal anterior margin, posterior margin rounded, tegumen emarginated in mid-region and well sclerotized. Lateral margin of tegumen rounded near vinculum but slightly concave towards posterior. Uncus lightly sclerotized except for lateral margins and medial structure. Ventroposterior margin of uncus at right angle to tip of uncus; base of median projection extending laterally, medial projection terminating in tip (tip broken in preparation). Vinculum well sclerotized in anterior third, almost of even width except for slight concavity on anterior dorsal margin; well separated from tegumen. Ventrally, vinculum thickened but without saccus. Anal tube weakly sclerotized; subscaphium well developed as medial structure, anteriorly with upturned tip. Valva subtriangular, costal apex elongated, dorsal margin concave, ventral margin convex, arching posteriorly and dorsally terminating in rounded apex, costal margin, especially ventrally, well sclerotized. Juxta broadened posteriorly, embracing ventral part of aedeagus, tapering anteriorly and arching into ventral, flattened transverse plate. Aedeagus widening from middle anteriorly, ventral half curving strongly ventrad, forming sclerotized ventral and membranous dorsal region. Vesica without cornuti but with regular sclerotized specks.

Paarl (slide preparation Som 019) (Figs 11–13): anterior third of tegumen separated by wide infolding, posterior region convex. Ventrolateral and dorsomedial margins of tegumen well sclerotized, lateral margin concave, strongly arching in posterior half. Medial process of uncus terminating in sharp downcurved tip, dorsoposterior margin of uncus emarginate and moderately sclerotized. Subscaphium well developed as medial structure, anteriorly with upturned region. Vinculum broad dorsally, widening in ventral region. Anellus membranous; juxta posteriorly moderately sclerotized, tapering anteriorly and arching strongly forming flattened anterior lobe. Valva with dorsal margin strongly concave, causing anterior elongation of costal margin; ventral



Figs 6–13. *Parapsycharium paarlense* n.gen., n.sp., male. **6**, Wing venation; **7–13**: Genitalia: **7**, lateral view; **8**, lateroventral view; **9**, dorsal view of uncus and tegumen; **10**, ventral view; **11**, lateral view; **12**, dorsal view of uncus and tegumen; **13**, juxta. Abbreviations: ae = aedeagus, j = juxta, t = tegumen, u = uncus, v = valva, vi = vinculum. Fig. 6, Paarl, slide preparation Som 034; Figs 7–10, Zachariashoek, slide preparation Som 018; Figs 11–13, Paarl, slide preparation Som 019. Scale bar (Figs 7–13) = 1 mm.

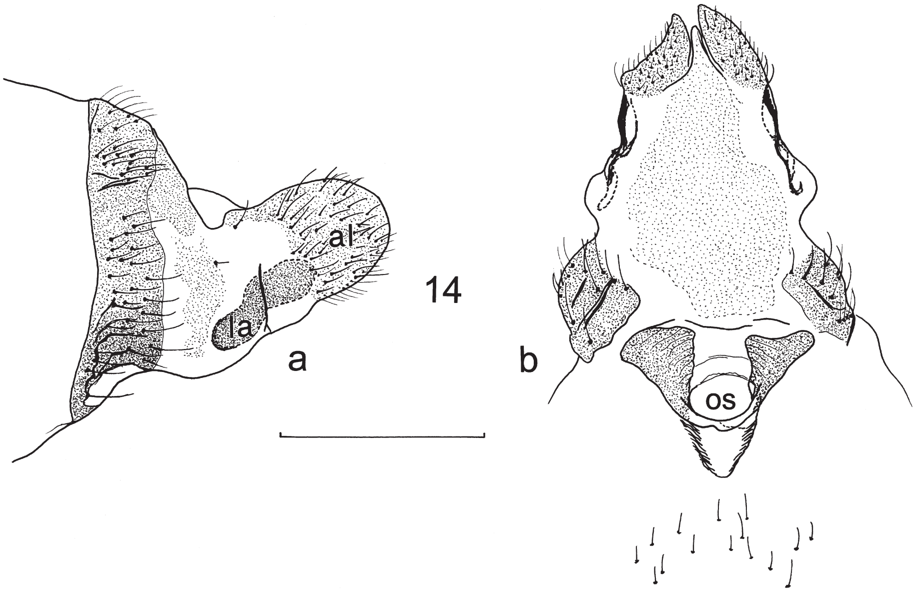


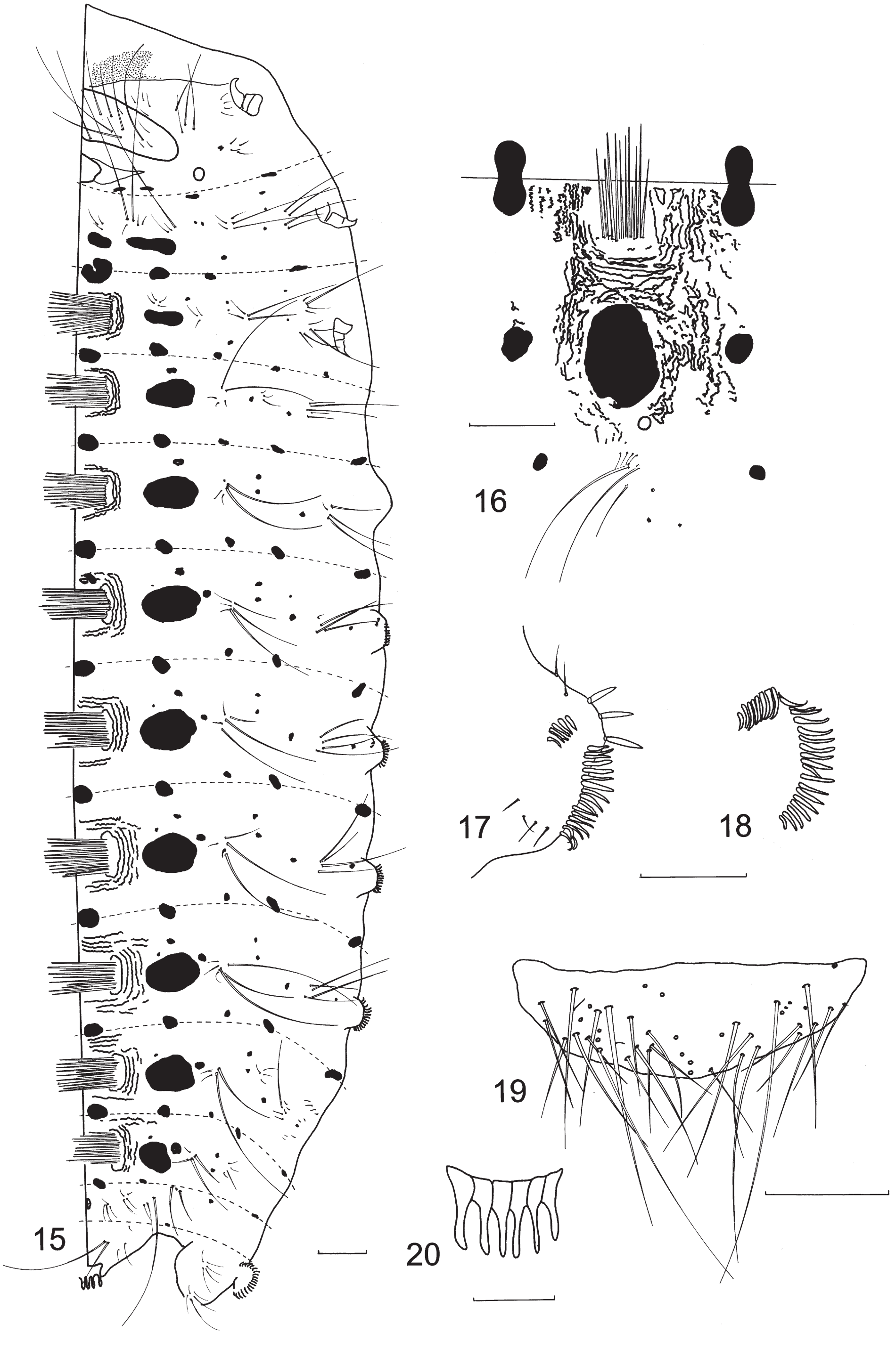
Fig. 14. *Parapsycharium paarlense* n.gen., n.sp. Female genitalia. **a**, Lateral view; **b**: dorsal view. Scale bar = 1 mm.

margin slightly curved dorsally, terminating in blunt apex. Aedeagus as for Zachariashoek.

Female (Figs 3–4, 14a,b (specimen Som 040)). Apterous, length ranging from 7.5 to 10 mm, excluding antennae. Antennae with stubby filiform flagellum, shaft of flagellum dorsally covered with whitish and some ochreous piliform setae; flagellum with 45–49 flagellomeres. Chaetosemata on lateral margin of bare epicranium. Antennal bases touching upper margin of eye, surrounded by ochreous-yellow scales. Posterior to eye collar appressed curved brown setae; posterior to chaetosemata dorsoposterior side of eye a distinct collar; remainder of ventral head vestiture brownish, on lateral side of head longish off-white setae forming lateral pilous ridge. Vertex with mainly blackish setae. In one female anterior part of eye collar clothed with broad short scales which are not piliform; these are rubbed off in the specimen described here. Frontal region with mixture of upturned and curved black and white bristly piliform setae; labral region with small ochreous tuft. Collar of prothorax consisting of laterally arranged piliform black and white setae, extending laterally into lobe-like pilous structures. Thoracical terga with strongly curved blackish setae, mid-anterior margin with erect setae, lateral part of thoracic segments with black and some whitish setae. Rest of body ventrally covered with white setae. Legs ochreous-brown, dorsally covered with piliform scales, femora with long, mostly whitish, setae. Anterior margin of first five abdominal segments dorsally clothed with long cupreous straight and bristly setae, posterior margins with short blackish setae. Terminal abdominal segments blackish, covered with terminal white setae. specimen described above.

Female genitalia (Figs 14 a,b). Anal lobes (al) oblong, rounded posteriorly, weakly sclerotized laterally and dorsally; lobes covered with short to longish bristly setae; posterior apophyses sclerotized with lateral arms (la) extending anteriorly and lateroventrally, broadest posteriorly, slightly narrower anteriorly with well-sclerotized rounded anterior margin. Eighth segment narrow, moderately sclerotized dorsally, more so lateroventrally, of irregular width without anterior apophyses and with mainly longish setae, some setae chalaza-like. Ostium (os) prominent, moderately sclerotized, anterior plate weakly and central part hardly sclerotized, lateroposterior extension enclosing anterior part of atrium, posterior plate hardly sclerotized with posteriorly rounded mesal indentation towards ostium; lateral parts triangular with rounded corners, distinctly sclerotized laterally but hardly so medially. Only four females have been obtained so far, of which two will be distributed intact to depository institutions. Two female are retained for comparative morphological descriptions.

Remarks. Limited intraspecific variation in the structure of male genitalia of *Psycharium* was reported by Geertsema (1998). Similar variation is



Figs 15–20. Chaetotaxy of mature larva of *Parapsycharium paarlense* n.gen., n.sp. **15**, Right half of integument; **16**, detail (lateral) of abdominal segment 4; **17**, mesal view of left proleg on abdominal segment 6; **18**, as in Fig. 17, ventral view showing arrangement of crochets; **19**, dorsal view of anal shield; **20**, anal crown. Slide preparation Som 033. Scale bars (Figs 15–16) = 1 mm, (Figs 17–20) = 0.5 mm.

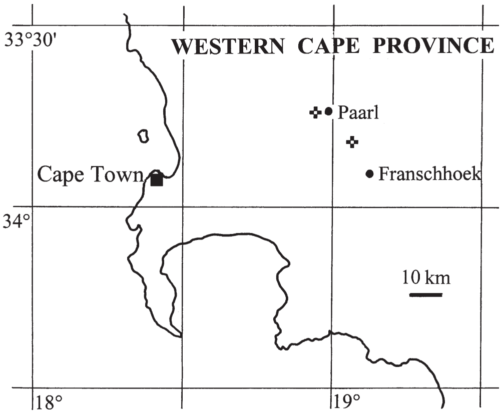


Fig. 21. Distribution of *Parapsycharium paarlense* (✣).

apparent in *P. paarlense* in the male genitalia of the Paarl and Zachariashoek populations respectively; specific distinction of these populations, only 15 km apart (Fig. 21), is not considered justified.

Distribution. Western Cape, South Africa (Fig. 21).

Larva (Figs 5, 15–20)

Material examined. Larvae collected on lower slopes of Paarl Mountain, 25.x.1985, on farm Driefontein in a small plantation of the exotic *P. radiata D. Don.* (The plantation has since been converted to a vineyard, destroying a known habitat of this new species.) Larvae found feeding on *Restio filiformis* Poir, *R. triticeus* Rottb., *Ischyrolepis triflora* (Rottb.) Linder (Restionaceae) and the exotic *P. radiata* (Coniferae) during October 1979 and 1985. Length of mature larva 25 mm. In general, setae of larvae less prominent than in *Psycharium,* regions around dorsal verrucae more 'crinkled' (Figs 15–16), segmental and intersegmental spots reduced.

Colour of mature larva. General colour impression greenish-black, head black. Background colour grey-black with large round to elliptical velvety-black mid-segmental areas on first eight abdominal segments; prothoracic lobe and anal shield brownish-black. Mid-dorsal line broad, green to charcoal-green, flanked by light or yellowish-green lateral line. Dorsal part of dorsal verrucae pinkish on all segments. Dorsolateral line yellowish-green, extending from mesothorax to eighth abdominal segment, on mesothorax anterior part of line terminating in pinkish suffusions. Yellow-green dorsolateral line interrupted by reddish-pink bases of L verrucae on ventrolateral and anterior sides, lateral area below base light green. Dorsal part of lateral line yellowish-green. Spiracles velvety-black.

Prothorax. Prothoracic lobe clearly delimited, with 4–5 long, curved and many smaller tactile setae; anterior to lobe some smaller setae; most setae directed anteriorly. Spiracles black, circular. L verrucae ventroanteriorly of ventral margin of lobe with 5–6 anteriorly directed moderately long setae. Small lateral segmental spot ventrad to lower margin of lobe; V verrucae ventral to and anterior to segmental spot on segment. All intersegmental spots except ventral one present and of similar size. Posterior to lobe, and adjoining with other side, a white diamond-shaped spot, flanked laterally by blackish triangular areas and anteriorly by a blackish suffusion.

Mesothorax. Dorsal elevated ridge consisting of D, SD and L verrucae present in middle of segment; D verrucae indicated by some small setae, SD verrucae by two long tactile setae and some smaller setae, all directed anteriorly and L verrucae by three long erect tactile and some shorter pale brown setae, also directed anteriorly. Vestiture of complex consisting of short black erect spikes, about 12 on D, 17 on SD and 10 on L verrucae. SL verrucae with three long setae, directed laterally and five short erect black setae. V verrucae on single elevation with about 15 stout, erect tactile setae. Mid-segmental spots: dorsal spot about half the size of subdorsal spot; ventrad to L verrucae two small lateral spots. Between SL and V verrucae three small sublateral segmental spots, arranged laterally. Intersegmental spots: dorsal one largest, almost round with anterior cleft; subdorsal spot second largest; lateral and sublateral spots smaller, elongate.

Metathorax. D verrucae consisting of curved dome with many (30–40) long, straight, hollow spikes, brown with sharp tips and a few smaller setae on margin of base. SD verrucae represented by four small setae. L verrucae consisting of some smaller setae; SL verrucae similar to L verrucae. V verrucae consisting of anterior and posterior parts, each with some laterally directed longer setae and some smaller setae. Mid-segmental spots: subdorsal spot slightly smaller than on mesothorax, one small supplementary subdorsal spot dorsoanteriorly of L verrucae; a pair of small, lateral dots just dorsal of SL verrucae and one bigger spot ventrolateral of lateral intersegmental spot. Two sublateral spots, each dorsoanteriorly of V verrucae, present. Intersegmental spots: dorsal spot smaller than on mesothorax, subdorsal spot similar to that of mesothorax; lateral, sublateral and ventral spots present; lateral spot biggest and ventral spot smallest of this group.

Abdominal segment 1. D verrucae as for metathorax, but SD verrucae absent, probably represented by a small segmental spot just anterior to subdorsal spot. L verrucae with two long, radially directed setae and some smaller ones. SL verrucae consisting of three smaller setae; V verrucae single structures consisting of two moderately long and 3–8 smaller setae. Mid-segmental spots: subdorsal spot almost twice as large as on metathorax; small group of 12 white scales present anterodorsally and smaller (1–3) group, ventroposteriorly. These scales range from typical flat to white, thin piliform scales. A small supplementary spot anterior to sublateral spot, a single sublateral spot dorsal to V verrucae. Intersegmental spots: similar to previous segment except for ventral spot, largest of lower three spots.

Abdominal segments 2–8 (Fig. 16). Similar to first abdominal segment but segmental spot anteroventral to subdorsal spot and ventral spot ventral to V verrucae. Lateral intersegmental spot becoming smaller towards posterior segments; abdominal segments 3 to 9 with small supplementary spot dorsoanterior of subdorsal spot.

Abdominal segment 9. D verrucae on ridge with few long setae, directed posteriorly; paired lateral segmental spots merged into one; intersegmental spots, except for lateral one, absent.

Abdominal segment 10. Anal shield (Fig 19) distinct but membranous with about 15 longer and many shorter tactile setae, all directed posteriorly. Anal prolegs with two gibbosities, each with some 6–8 moderately long setae, directed mainly laterally. Anal comb (Fig. 20) with five teeth.

The number of crochets (short and long series respectively) and setae on the abdominal prolegs are as follows: on 2: 5–6 setae; on 3: 7–8+19, setae 3–4+2; on 4: 5–7+19–20, 5+2 setae; on 5: 6–7+19–22, 3–4+3 setae; on 6: 5–7+18, 5+1–2 setae; on 7: 8–9 setae; and on anal segment 29 crochets.

Slide preparation Som 033, to be deposited in the Transvaal Museum, Pretoria.

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